Chapter 19.75 GEOLOGICAL HAZARDS ORDINANCE* (Formerly "Natural Hazard Areas")

* This ordinance includes surface fault rupture, liquefaction, landslide, debris flow, rockfall, avalanche, and other geologic hazards. Chapter 19.74 contains floodplain hazard regulations.

19.75.010 Purpose of provisions.

The purpose of the geologic hazards ordinance is to promote the health, safety and general welfare of the citizens of the County, and minimize the potential adverse effects of geologic hazards to public health, safety and property by encouraging wise land use in geologically hazardous areas. (Ord. 1500 (part), 2002: Ord. 1074 § 2 (part), 1989)

19.75.020 Definitions.

As used in this chapter, the following terms have the following meanings:
"Active fault" means a fault displaying evidence of greater than four inches of displacement along one or more of its traces during Holocene time (about 10,000 years ago to the present).
"Avalanche" means a large mass of snow, ice, and debris in swift motion down a slope; includes both wet and dry snow avalanches.
"Buildable area" means that portion of a site where an approved engineering geology and/or geotechnical report, as required, has indicated is not impacted by geologic hazards, or concluded that the identified hazards can be mitigated to a level where risk to human life and property are reduced to an acceptable and reasonable level, and where structures may be safely sited. Buildable areas must be clearly marked on the site plan and/or final approved plat, as appropriate.
"Critical facilities" means essential facilities, and lifelines such as major utility, transportation, and communication facilities and their connections to essential facilities.
"Debris flow" means a slurry of rock, soil, organic material, and water transported in an extremely fast and destructive flow that flows down channels and onto and across alluvial fans; includes a continuum

of sedimentation events and processes including debris, flows, debris floods, mudflows, clearwater floods, and alluvial fan flooding.
“Development” includes all critical and essential facilities, subdivisions, single- and multi-family dwellings, commercial and industrial buildings, additions to existing buildings, storage facilities, pipelines and utility conveyances, and other land uses.
“Engineering geologist” means a geologist who, through education, training and experience, is able to conduct field investigations and interpret geologic conditions to assure that geologic factors affecting engineered works are recognized, adequately interpreted, and presented for use in engineering practice and for the protection of the public.
“Engineering geology” means the application of geological data, principles and interpretation so that geological factors affecting planning, design, construction, and maintenance of engineered works are properly recognized and adequately interpreted.
“Essential facility” means buildings and other structures that are intended to remain operational in the event of extreme environmental loading from snow or earthquakes, including all Category II and III structures as classified in Table 1604.5 of the Building Code.
“Fault” means a fracture in the earth’s crust forming a boundary between rock or soil masses that have moved relative to each other (see “Active fault”).
“Fault setback” means an area on either side of a fault within which construction of structures for human occupancy or critical facilities is not permitted.
“Fault scarp” means a steep slope or cliff formed by movement along a fault.
“Fault trace” means the intersection of a fault plane with the ground surface, often present as a fault scarp, or detected as a lineament on aerial photographs.
“Fault zone” means a corridor of variable width along one or more fault traces, within which deformation has occurred.
“Geologic hazard” means a surface fault rupture, liquefaction, landslide, debris flow, rockfall, avalanche, and/or other geologic processes that may present a risk to life and property.
“Geologic hazard maps” refers to the following maps showing Geologic Hazards Special Study Areas in unincorporated Salt Lake County:
A. “Surface Fault Rupture and Liquefaction Potential Special Study Areas” dated March 31, 1989 and revised March 1995;
B. “Avalanche Special Study Areas” dated March 31, 1989;
C. “Landslide, Debris Flow, and Rockfall Special Study Area Map” dated April 9, 2002.
“Geologic Hazard Special Study Area” means a potentially hazardous area as shown on the geological hazards maps, or in other areas defined under “Applicability” (Section 19.75.030), within which hazard investigations are generally required prior to development.
“Geotechnical Engineer” means a professional engineer licensed in the State of Utah whose education, training and experience, is in the field of geotechnical engineering.
“Geotechnical Engineering” means the investigation and engineering evaluation of earth materials including soil, rock and man-made materials and their interaction with earth retention systems, foundations, and other civil engineering works. The practice involves the fields of soil mechanics, rock mechanics, and earth sciences and requires knowledge of engineering laws, formulas, construction techniques, and performance evaluation of engineering.
“Governing body” means the County Council, or to a future successor body to the County Council.
“Landslide” means a general term for the downslope movement of a mass of soil, surficial deposits or bedrock, including a continuum of processes between landslides, earthflows, mudflows, debris flows and debris avalanches, and rockfall.
“Liquefaction” means a process by which certain water-saturated soils lose bearing strength because of earthquake-related ground shaking and subsequent increase of groundwater pore pressure.
“Non-Buildable Area” means that portion of a site which an engineering geology report has concluded

may be impacted by geologic hazards that cannot be feasibly mitigated to a safe level, and where siting of structures is not permitted.
“Rockfall” means a rock, or mass of rock, newly detached from a cliff or other steep slope which moves downslope by falling, rolling, toppling, or bouncing; includes rockslides, rockfall avalanches, and talus.
“Setback” means an area within which construction of habitable structures or critical facilities is not permitted.
“Slope Stability” means the resistance of a natural or artificial slope or other inclined surface to failure by landsliding; usually assessed under both static and dynamic (earthquake induced) conditions.
“Structure designed for human occupancy” means any residential dwelling or other structure used or intended for supporting or sheltering any human occupancy. (Ord. 1500 (part), 2002: Ord. 1473 (part), 2001: Ord. 1267 § 2, 1994; Ord. 1074 § 2 (part), 1989)

19.75.030 Applicability.

These regulations are applicable to:
A. All lands within Geological Hazard Special Study Areas in unincorporated Salt Lake County, as shown on the following geologic hazards maps on file with the County Planning and Development Services Division:
1. “Surface Fault Rupture and Liquefaction Potential Special Study Areas” dated March 31, 1989 and revised March 1995;
2. “Avalanche Special Study Areas” dated March 31, 1989; and
3. “Landslide, Debris Flow, and Rockfall Special Study Areas” dated April 9, 2002.
B. Because not all geologic hazards are identified on the above maps due to their scale, this ordinance also applies to areas within the Foothills and Canyons Overlay Zone, as indicated by a map of that title adopted on January 21, 1998, Chapter 19.72 of the Salt Lake County Zoning Ordinance, as amended; and
C. Areas where slopes are in excess of thirty percent; and
D. Areas where topography, geology, soil conditions, slope instability, slope angle or aspect, whether on-site or off-site, indicate a potential for geologic hazards.
Such maps and areas described above and all amendments thereto are made a part of this chapter as if fully described and detailed herein. Each change in the geologic hazards maps shall be subject to the amendment procedures set forth in Chapter 19.90. (Ord. 1500 (part), 2002: Ord. 1473 (part), 2001: Ord. 1074 § 2 (part), 1989)

19.75.040 Disputes.

Disputes may arise when:
a. there is a conflict between the boundary lines illustrated on the map and actual field conditions,
b. detailed investigations show that mapped hazards are not present within a particular area, or
c. field conditions indicate that unmapped hazards may exist that require study.
Disputes shall be settled as follows:
A. The person disputing the special study area boundary or the presence of mapped or unmapped hazard(s) within a particular area shall submit technical and geologic evidence to support their claim to the County Geologist in the form of a site-specific geologic hazards report (see Section 19.75.060).
B. The County Geologist may request the Utah Geological Survey, U.S. Forest Service, and/or other experts to review the evidence (third-party review) prior to making a decision concerning the dispute. The cost of the third-party review shall be paid by the person disputing the map.
C. The County Geologist may allow deviations from the mapped boundary line only if evidence is provided by the applicant that, to the satisfaction of the County Geologist, clearly and conclusively establishes that the Geologic Hazard Special Study Area boundary location is incorrect, or that the

mapped hazards are not present within a particular area.
D. Any decision of the County Geologist may be appealed to the Board of Adjustment pursuant to the appeal procedures set forth in Section 19.92.050. (Ord. 1500 (part), 2002: Ord. 1473 (part), 2001: Ord. 1074 § 2 (part), 1989)

19.75.050 Studies and reports required.

Any applicant requesting development on a parcel of land within a Geologic Hazard Special Study Area, as required under Chart 19.75.050, or in other applicable areas as defined in Section 19.75.030, shall submit to the Planning and Development Services Division two copies of a site-specific geologic hazard study and report. (Ord. 1500 (part), 2002: Ord. 1267 § 3, 1994: Ord. 1074 § 2 (part), 1989)

19.75.060 Geologic hazard and engineering geology reports.

This section describes requirements for site-specific geologic hazard studies and reports, where required according to Section 19.75.050, the Geologic Hazard maps and Chart 19.75.050:
A. An engineering geology report that includes a geologic hazards investigation and assessment shall be prepared by a qualified engineering geologist, except as provided in Sections 19.75.060 (C) and (F), below. A "qualified engineering geologist" requires 1) an undergraduate or graduate degree in geology, engineering geology, or a related field with a strong emphasis in geologic coursework, from an accredited university; 2) at least three full years of experience in a responsible position in the field of engineering geology; and 3) per State law, after January 1, 2003, geologists practicing before the public must be licensed in Utah. The report shall be site-specific and shall identify all known or suspected potential geologic hazards, originating on-site or off-site, whether previously mapped or unmapped, that may affect the particular property. All reports shall be signed and stamped by the preparer and include the qualifications of the preparer.
B. Fault rupture hazard reports shall contain all requirements as described in the document "Minimum Standards for Surface Fault Rupture Studies" published by Salt Lake County, and incorporated by reference as Appendix A of this ordinance. Fault study reports shall be prepared, signed, and stamped by a qualified engineering geologist as described in Appendix A.
C. The report shall include a detailed site map (scale: one inch equals two hundred feet or larger), showing the location of the hazard(s) with delineation of the recommended setback distances from hazards(s) and the recommended location for structures.
C. Liquefaction analyses shall contain all requirements as stated in the document "Liquefaction: A Guide to Land Use Planning" published by Salt Lake County, and incorporated by reference as Appendix B to this ordinance. Liquefaction analyses shall be prepared by a qualified professional geotechnical engineer licensed in the State of Utah, and shall include the professional engineer's original stamp and signature.

Chart 19.75.050
Special Study Area Report Requirements
Based on Special Study Area Maps
Is a Site-Specific Geologic Hazards Report Required Prior to Approval?

		Liquefaction Potential			
Land Use (Type of Facility)	**Surface Fault Rupture**	**HIGH and MODERATE**	**LOW and VERY LOW**	**Landslide, Debris Flow & Rockfall**	**Avalanche**
Critical and Essential Facilities as defined in Section 19.75.020	Yes	Yes	Yes	Yes	Yes
Industrial and Commercial Bldgs. (1 story and <5,000 sq. ft.)	Yes	No*	No	Yes	Yes
Industrial and Commercial Bldgs. (>5,000 sq. ft.)	Yes	Yes	No	Yes	Yes
Residential-Single Lots/Single Family Homes	Yes	No*	No	Yes	Yes
Residential Subdivisions (>9 Lots), and Residential Multi-Family Dwellings (4 or more units per acre)	Yes	Yes	No	Yes	Yes
Residential Subdivisions (<9 Lots), and Residential Multi-Family Dwellings (<4 units per acre)	Yes	No*	No	Yes	Yes

* Although a site-specific investigation is not required, the owner is required to file a disclosure notice prior to land-use approval

D. Debris flow hazard studies and reports shall include test pits or trench logs (scaled 1 inch to 5 feet), include estimates of the number and frequency of past events and their thicknesses, volume and maximum clast sizes; and include estimates of the recurrence, depth, and impact forces anticipated in future events. While debris flow hazard analyses may require contributions from hydrologists and engineers, the debris flow report shall be under the control of, and prepared by, a qualified engineering geologist, and shall include the geologist's qualifications to perform the study (such as their experience in performing similar studies).

E. Landslide reports shall be prepared in accordance with the Utah Geological Survey's "Guidelines for Evaluating Landslide Hazards in Utah" (Hylland, 1996). Landslide reports shall be prepared, signed, and stamped by a qualified engineering geologist, and include the qualifications of the preparer. Slope stability or other analyses included in these reports shall include both static and dynamic conditions, and shall be prepared by a qualified professional geotechnical engineer licensed in the State of Utah, and shall include the professional engineer's original stamp and signature.

F. Snow avalanche hazard reports shall be prepared in accordance with the document "Snow-Avalanche Hazard Analysis for Land Use Planning and Engineering" (Colorado Geological Survey Bulletin 49) or other appropriate references. Avalanche hazard reports must be prepared by an experienced avalanche expert, and shall include the avalanche expert's qualifications to perform the study (such as their

experience in performing similar studies).
G. Other geologic hazard or engineering geology reports shall be prepared in accordance with Utah Geological Survey Miscellaneous Publication M, "Guidelines for Preparing Engineering Geologic Reports in Utah." All reports shall be signed by the preparer and include the qualifications of the preparer. Generally, these reports must be prepared, signed, and stamped by a qualified engineering geologist licensed in the State of Utah. However, reports co-prepared by a professional engineer must include the professional engineer's original stamp and signature.
H. All reports shall include, at a minimum:
1. A 1:24,000-scale geologic map (with reference) showing the surface geology, bedrock geology (where exposed), bedding attitudes, faults or other structural features, and the locations of any geologic hazards;
2. A detailed site map of the subject area showing any site-specific mapping performed as part of the geologic investigation, and including boundaries and features related to any geologic hazards, topography, and drainage. The site map must show the location and boundaries of the hazard(s), delineation of any recommended setback distances from hazard(s), and recommended location(s) for structures. Buildable and non-buildable areas shall be clearly identified. Scale shall be one inch equals two hundred feet or smaller.
3. Trench logs and test pit logs (scale: 1 inch equals 5 feet, or smaller), boring logs (scale: 1 inch equals 5 feet, or smaller), aerial photographs, references with citations, and other supporting information, as applicable (Ord. 1074 § 2 (part), 1989).
4. Conclusions that summarize the characteristics of the geologic hazards, and that address the potential effects of the geologic conditions and geologic hazards on the proposed development and occupants thereof in terms of risk and potential damage.
5. Specific recommendations for additional or more detailed studies, as may be required to understand or quantify the hazard, evaluate whether mitigation measures are required, and evaluate mitigation options.
6. Specific recommendations for avoidance or mitigation of the effects of the hazard(s), consistent with the purposes set forth in Section 19.75.010. Design or performance criteria for engineered mitigation measures and all supporting calculations, analyses, modeling or other methods, and assumptions, shall be included in the report. Final design plans and specifications for engineered mitigation must be signed and stamped by a qualified professional geotechnical or structural engineer, as appropriate.
7. Evidence on which recommendations and conclusions are based shall be clearly stated in the report.
I. Additional or more detailed studies may be required, as recommended by the report or as determined by the County Geologist, to understand or quantify the hazard, or to evaluate whether mitigation measures recommended in the report are adequate. (Ord. 1500 (part), 2002: Ord. 1074 § 2 (part), 1989)

19.75.070 Review of reports--Approval procedure.

A. In order to fulfill the purposes of this chapter, the Planning and Development Services Division or the Planning Commission, as appropriate under the County's Development Standards, shall review any proposed land use which requires preparation of a geologic hazard report under this chapter to determine the possible risks to the safety of persons or property from geologic hazards.
B. Prior to consideration of any such development by the Planning and Development Services Division and the Planning Commission, the geologic hazard report shall be submitted to the County Geologist for review and recommendation. The County Geologist may request the Utah Geological Survey, the U.S. Forest Service, and/or other experts to review the report (third-party review) and provide additional recommendations. Any cost the county must pay for such third-party reviews shall be paid by the applicant prior to Planning Commission or Planning and Development Services Division action. The County Geologist shall file a copy of the geologic hazard report in the County Geologist's Geologic Hazards Library, and another copy in the Planning and Development Services project file. A

copy may also be forwarded to the Utah Geological Survey.
C. The County Geologist and other retained experts in their review of the report, and the Planning Commission or Planning and Development Services Director in their consideration of the development, shall determine whether the development complies with all of the following standards:
1. A suitable geologic hazard report has been prepared by a qualified professional as defined in Section 19.75.060.
2. The proposed land use does not present an unreasonable risk to the safety of persons or property (including buildings, storm drains, public streets, utilities or critical facilities, whether off-site or on-site), or to the aesthetics and natural functions of the landscape (e.g. slopes, streams or other waterways, drainage, wildlife habitat, etc., whether off-site or on-site) because of the presence of geologic hazards or because of modifications to the site due to the proposed land use;
3. At the Planning Commission's discretion, with advice from the County Geologist, the proposed land use may be approved if the applicant submits substantial evidence in the geologic hazard report that, using best available practices, the identified hazards can be mitigated to a level where the risk of human life and damage to property are reduced to an acceptable and reasonable level in a manner which has a minimum effect on the natural environment. Mitigation measures should consider, in their design, the intended aesthetic functions of other governing ordinances such as the Foothills and Canyons Overlay Zone (Ch. 19.72).
D. Any area determined to contain geologic hazards to life or property shall not be approved for development unless the applicant demonstrates that the identified hazards or limitations can be overcome in such a manner as to minimize hazard to life or property. The applicant must include, with the geologic hazards report, an acceptable mitigation plan that defines how the identified hazards or limitations will be overcome in such a manner as to minimize hazard to life or property, as described in Section 19.75.070C(1), above, and without impacting or affecting off-site areas.
E. The County Geologist may set other requirements as are necessary to overcome any geologic hazards and to ensure that the purposes of this chapter are met. These requirements may include, but are not limited to:
1. Additional or more detailed studies to understand or quantify the hazard or determine whether mitigation measures recommended in the report are adequate;
2. Specific mitigation requirements; establishment of buildable and/or non-buildable areas; limitations on slope grading; and/or revegetation;
3. Installation of monitoring equipment and seasonal monitoring of surface and subsurface geologic conditions, including groundwater levels;
4. Other requirements such as time schedules for completion of the mitigation, phasing of development, etc.
F. The Planning Commission or Planning and Development Services Director may set requirements necessary to reduce the risks from geologic hazards as a condition to the approval of any development which requires a geologic hazards report. (Ord. 1500 (part), 2002: Ord. 1473 (part), 2001: Ord. 1417 § 7, 1998: Ord. 1074 § 2 (part), 1989)

19.75.080 Requirements in geologic hazard areas.

19.75.081 Active fault considerations.

A. No critical facility (excluding transportation lines or utilities, which by their nature may cross active faults) or structures designed for human occupancy shall be built astride an active fault. A fault study must be prepared as defined in Sections 19.75.030 and 19.75.060, and Appendix A, prior to final approval of the land use or building permits. If a fault is discovered in the excavation for such a structure, whether located within a Special Study Area or not, a special study, as described in Section 19.75.060 must be performed to determine if the fault is active. If the fault is determined to be active,

the procedures set forth in Section 19.75.070 shall be followed. The fault study report shall establish a fault setback on either side of the fault following the requirements in Appendix A, within which no critical facilities or structures for human occupancy shall be placed.
B. No structure designed for human occupancy shall be built on a fault scarp. Footing setbacks from a fault scarp shall meet the requirements in Appendix A or the requirements of the Building Code, whichever is more stringent. The Planning and Development Services Director may increase footing setback requirements where information from a geotechnical report indicates slope conditions warrant a greater setback distance. (Ord. 1500 (part), 2002: Ord. 1267 § 4, 1994: Ord. 1074 § 2 (part), 1989).

19.75.082 Liquefaction considerations.

A. Liquefaction analyses shall be performed for all critical facilities regardless of the mapped special study area designation for the site.
B. For all structures for which a liquefaction analysis indicates that ground settlement may be anticipated, the project structural engineer shall provide documentation to the County Geologist that the building will be designed to accommodate the predicted ground settlements, in such a manner as to be protective of life safety during the design event. (Ord. 1500 (part), 2002)

19.75.083 Avalanche considerations.

A. Development of structures for human occupancy is not permitted within an avalanche special study area, or in other areas where avalanche hazards may exist, unless a detailed avalanche hazard analysis is performed, as described in Section 19.75.060, by a qualified avalanche expert.
B. If the avalanche analysis indicates that the site may be impacted by avalanches, the report shall delineate the following areas:
1. A “red zone” of high avalanche potential [return period of twenty-five years or less, and/or impact pressures over six hundred pounds per square foot (psf)] within which critical facilities or structures for human occupancy are not permitted;
2. A “blue zone” (return period between twenty-five and three hundred years, and impact pressures less than six hundred psf) within which critical facilities or structures for human occupancy shall only be permitted when at least one of the following requirements has been met:
a. The structure is designed to incorporate direct protection measures that address the estimated impact forces (flowing snow/debris and powder blast loading). The estimated impact forces shall be calculated by the avalanche expert. The structure shall be designed by, and the plans stamped by, a qualified structural engineer licensed in the State of Utah; or
b. Appropriate engineering controls (i.e. deflection structures, snow retention nets, dams, etc.) are designed and installed to mitigate the avalanche hazard. Design or performance criteria for engineered mitigation measures (including estimated impact forces, flow heights, location and dimensions of the mitigation structures) and all supporting modeling or other analyses, calculations, and assumptions, shall be calculated by the avalanche expert and included in the report. Final design plans and specifications for engineered mitigation must be signed and stamped by a qualified professional geotechnical or structural engineer, as appropriate, licensed in the State of Utah. (Ord. 1500 (part), 2002)

19.75.090 Disclosure.

19.75.091 Disclosure when a geologic hazards report is required.

Whenever a geologic hazards report is required under this chapter, the owner of the parcel shall record a restrictive covenant running with the land in a form satisfactory to the County prior to the approval of any development or subdivision of such parcel. Disclosure will include signing a Disclosure and Acknowledgment Form provided by the County, which will include the following:
A. Notice that the parcel is located within a Geologic Hazard Special Study Area as shown on the

geologic hazard map or otherwise defined in Section 19.75.030;
B. Notice that a geologic hazards report was prepared and is available for public inspection in the County Geologist's Geologic Hazards Library;
C. Where geologic hazards and related setbacks are delineated in subdivisions and PUDs, the owner shall also place additional notification on the plat stating the above information, prior to final approval of the plat. (Ord. 1500 (part), 2002: Ord. 1473 (part), 2001: Ord. 1319 § 2, 1995: Ord. 1074 § 2 (part), 1989)

19.75.092 Disclosure when a geologic hazards report is not required.

Whenever a parcel to be developed is located within a Geologic Hazard Special Study Area but a geologic hazards report is not required under this chapter (such as but not limited to, a single-family home located in a moderate liquefaction potential area), notice that the parcel is located within such area(s) shall be recorded by the land owner by signing a Disclosure and Acknowledgment Form provided by the County, prior to the approval of any such development. (Ord. 1500 (part), 2002: Ord. 1074 § 2 (part), 1989)

19.75.100 Warning and disclaimer.

The geologic hazards ordinance codified in this chapter and geologic hazard maps represent only those hazardous areas known to the County, and should not be construed to include all possible potential hazard areas. The geologic hazards ordinance and the geologic hazard maps may be amended as new information becomes available pursuant to procedures set forth in Chapter 19.90. The provisions of this chapter do not in any way assure or imply that areas outside its boundaries will be free from the possible adverse effects of geologic hazards. This chapter shall not create liability on the part of the County, any officer or employee thereof for any damages from geologic hazards that result from reliance on this chapter or any administrative requirement or decision lawfully made thereunder. (Ord. 1500 (part), 2002: Ord. 1074 § 2 (part), 1989)

19.75.110 Change of use.

No change in use which results in the conversion of a building or structure from one not used for human occupancy to one that is so used shall be permitted unless the building or structure complies with the provisions of this chapter. (Ord. 1500 (part), 2002: Ord. 1267 § 5, 1994)

19.75.120 Conflicting regulations.

In cases of conflict between the provisions of existing zoning classifications, building code, subdivision ordinance, or any other ordinance of the county and the geologic hazards ordinance codified in this chapter, the most restrictive provision shall apply. (Ord. 1500 (part), 2002: Ord. 1074 § 2 (part), 1989).